Analysis of Lead in Coachella Valley Drinking Water

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Abstract

Lead (Pb) is a tasteless and odorless toxin that has been banned from use in wetted surfaces that carry drinking water. Lead can leach into drinking water from deteriorating pipes, solder, fittings, and faucets. Motivated by recent events in Flint, Michigan, we tested samples of local drinking water for concentrations of Pb. Lead concentrations were analyzed through spectrophotometry.

Procedure

The Hach LeadTrak Fast Column Extraction method was used. In this method, samples are filtered through a cotton ball in a syringe. Eluent is then filtered through the same cotton ball in the same syringe. Color reagents are then added, and the sample is then inserted into the spectrophotometer for analysis.

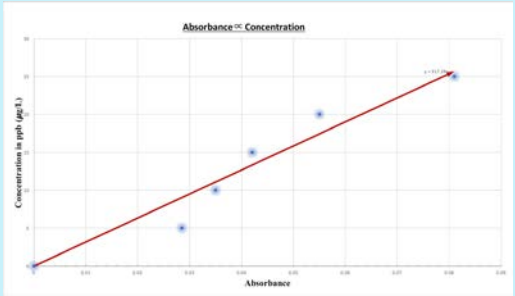
Methodology

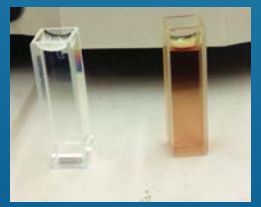
1. Lead stock concentrations of 1, 5, 10, 15, 20, and 25 parts per billion were prepared.
2. Absorption data from stock concentrations were used to make a calibration curve. This curve was used to calculate concentrations of lead in field samples.
3. Field samples of first-draw drinking water (water that has been sitting in the pipes for six hours or more) were collected in plastic bottles and were preserved with acid.
4. Samples and stock concentrations were processed through a lead extractor kit. Samples were pressed through a cotton ball in a syringe, and then eluent was then pressed through the same syringe and cotton ball.
5. Reagents and colorizers from the kit were added to each sample.
6. Samples were measured by a spectrophotometer at 477 nm wavelength and compared to known standard samples.

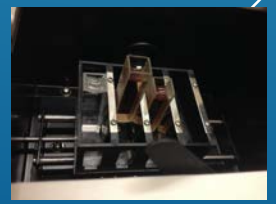
Data

Location	Water District	Year House was Built	Concentration of Lead (ppb)
Desert Hot Springs - House 1	Mission Springs Water District	1980	0.63
Cathedral City - House 2	Coachella Valley Water District	1990	<0.01 No Detection
Cathedral City - House 3	Desert Water Agency	1957	3.5
Palm Desert - House 4	Coachella Valley Water District	1975	2.53
College of the Desert - Fountain A	Coachella Valley Water District	1998+	<0.01 No Detection
Bermuda Dunes - House 5	Myoma Dunes Water Company	1987	<0.01 No Detection
La Quinta - House 6	Mission Springs Water District	1992	<0.01 No Detection
Indio - House 7	Coachella Valley Water District	2000	<0.01 No Detection
North Shore - House 8	Coachella Valley Water District	2004	1.27

Calibration Curve







Results

The EPA standard for concentrations of lead in drinking water is 15 parts per billion. After testing multiple houses from the surrounding water districts, this investigation found no actionable contamination of lead in local drinking water. Most houses and public plumbing tested negative from any presence of lead. The highest concentration of lead found was from a house was 3.50 parts per billion, which is well below the established EPA safe limit.

There may be a correlation between the age of a house and its likelihood of having lead contamination. Regulations did not address the presence of lead in pipes until the Safe Drinking Water Act and its amendments. Houses built before these regulations may have been constructed with plumbing that contained lead alloys, which can degrade from age and acidic water to release lead into drinking water.

The sample size is by no means large enough to make sweeping generalizations of the valley's water supply. Local water reports indicate there is no presence of lead in the source water, and a lack of detection of lead would appear to validate these reports. However, since lead contamination is usually caused by the degradation of plumbing, lead contamination can be a very localized issue. It is wise to test any house suspected of utilizing old plumbing, or new plumbing suspected of containing lead alloys, as home testing kits are available for purchase, and laboratories will test home samples at relatively small expense.

References

Spectrophotometer Instrumentation: Principle and Application. [Photograph]. Biochemistry Den. Biochemistry Resources. 2017. Accessed January 16, 2017.

Light and the Electromagnetic Spectrum. [Photograph]. Biology Discover Life. 2017. Accessed January 2017.

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